HOMOTRYPA AND *AMPLEXOPORA?* FROM THE CARADOC SERIES, SHROPSHIRE

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ABSTRACT. Additional bryozoan species from the *Harknessella subquadrata* horizon of the Hoar Edge Limestone, Evenwood Quarry, include unique inverted cone-shaped colonies of *Homotrypa oweni* sp. nov. and two species questionably assigned to *Amplexopora*, *Amplexopora? evenensis* sp. nov. and *Amplexopora?* sp. A.

MATERIAL collected in 1963 by Dr. D. Owen, Manchester University Museum, from the upper part of the Evenwood Quarry, Shropshire, in the *Harknessella subquadrata* horizon of the Hoar Edge Limestone, permits observations on bryozoan species of *Homotrypa* and *Amplexopora?* that add to the bryozoan fauna described by Ross (1963). This additional material in a large slab from Evenwood Quarry includes a great abundance of *Homotrypa oweni* sp. nov. Associated with it are *Phaenopora stubblefieldi* Ross and *Amplexopora? evenensis* sp. nov., which are common, and fragments of *Amplexopora thomasi* Ross and *Amplexopora?* sp. A, which are sparse.

The three newly discovered species, *Homotrypa oweni*, *Amplexopora? evenensis*, and *Amplexopora?* sp. A, are distinctly different from previously described species of these genera. The distinctive inverted-cone shape of colonies of *Homotrypa oweni* permits ready identification of this species. However, the phylogenetic affinities of this species are at present not determinable as it appears to have little similarity with previously described species. *Amplexopora? evenensis* and *Amplexopora?* sp. A both display strongly crenulate zooecial walls which thicken only slightly in the narrow peripheral regions. Such a marked crenulation of the zooecial walls as is seen in these two species has not been noted so far in other species of the genus *Amplexopora*, so that these two Caradocian species have been assigned with question to *Amplexopora*. The concentration of diaphragms in the subperipheral region and the narrowness of the peripheral region are distinctive features of *Amplexopora? evenensis*. *Amplexopora?* sp. A has isolate cystiphragms on its distal walls, which together with limited diaphragms in the zooecial tubes and numerous diaphragms in the mesopores, single out this species. *Amplexopora? evenensis* has some general similarities in the structure of the peripheral region and size and shape of acanthopores with certain species of *Amplexopora* from the Champlainian and Cincinnatian Series of North America, including such species as *A. winchelli* (Ulrich), *A. pustulosa* Ulrich, *A. ampla* Ulrich and Bassler, and *A. convoluta* Bassler; however, for reasons noted above it has no strong affinities with any of these species. *Amplexopora?* sp. A has little similarity to previously described species.

SYSTEMATIC DESCRIPTIONS

Family MONTICULIPORIDAE

Genus HOMOTRYPA Ulrich

Homotrypa oweni sp. nov.

Plate 2, figs. 1–5; Plate 3, fig. 6; Table 1

[Palaeontology, Vol. 8, Part 1, 1965, pp. 5–10, pl. 2–3.]

Material. Holotype, LL 2807A; three figured *paratypes*, LL 2807B–D; 8 unfigured thin-sectioned *paratypes*, LL 2807E–L; three unfigured hand-specimen *paratypes*, LL 2807M–O.

Description. Hollow, inverted-cone shaped colonies encrust calcite fragments and crinoid columnals (Pl. 2, fig. 5). The cones are about 2 to 3 mm. in diameter at the tapered end and expand distally to 4 mm.

The subpolygonal zooecial openings interlock in a regular arrangement and cystiphragms are visible across the zooecial openings (Pl. 2, figs. 1, 2, 5). Short zooecial tubes are reclined for a short distance in the proximal part along the basal lamina; zooecial tubes are straight for the remainder of their length (Pl. 2, figs. 3–5; Pl. 3,

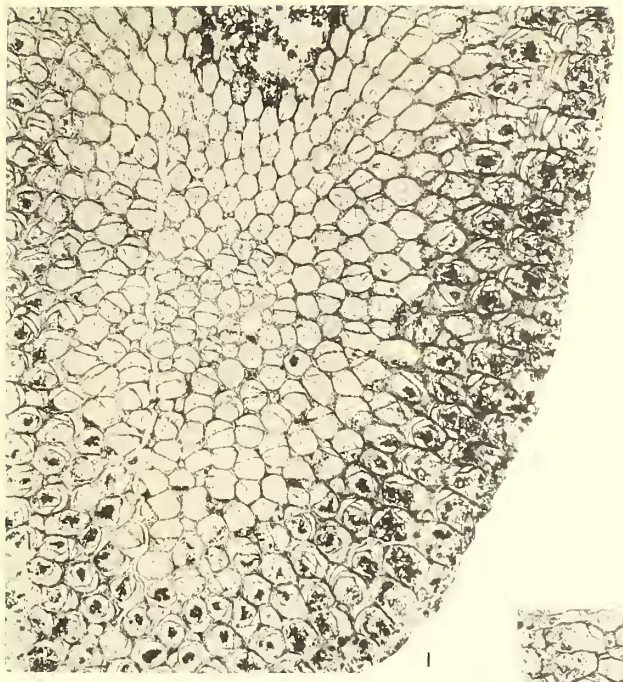
TABLE 1. Measurements of *Homotrypa oweni* sp. nov. (in millimetres)

Catalogue no.	*LL 2807B*	*LL 2807A*	*LL 2807C*
Diameter of colony	Not determined	2·6 to 3·8	2·6 to 4·1
Length of colony	Not determined	12·5	9
No. of zooecia per 2 mm. longitudinally	9 to 10	8 to 10	9 to 11
Diameter of zooecial opening, max.	0·24×0·24	0·24×0·22	0·18×0·18
min.	0·13×0·16	0·18×0·18	0·15×0·13
Combined thickness of adjacent zooecial walls in peripheral region	0·01 to 0·02	0·01 to 0·02	0·02 to 0·03
Diameter of mesopore, max.	0·08×0·06	0·08×0·10	0·08×0·10
min.	0·04×0·04	0·05×0·05	0·03×0·03
Diameter of acanthopore	0·02	0·01 to 0·02	0·02
No. of acanthopores per zooecium	1 to 3	2 to 3	1 to 4
No. of diaphragms per 1 mm. in zooecial tube in peripheral region	Not determined	1 to 2	Not determined

fig. 6). Diaphragms are sparse in the zooecial tubes, commonly one diaphragm in the upper part or reclined portion of zooecial tube and another diaphragm more distally located; diaphragms more closely spaced in mesopores, 4 to 5 in length of mesopore. Mesopores develop in distal region of reclined portion of zooecial tubes (Pl. 2, fig. 5). Cystiphragms occur almost always as regular overlapping structures on the distal walls of zooecial tubes and rarely occur on the proximal zooecial walls; they develop just above the inclined portion of zooecial tubes and succeeding cystiphragms overlap by a half to one-third the preceding cystiphragms (Pl. 2, figs. 3–5; Pl. 3, fig. 6). Acanthopores are small and indistinct and are difficult to locate in longitudinal sections; in tangential sections they occur at the junctions of zooecial and mesopore walls and appear as small dark spots (Pl. 2, fig. 2). Two to four mesopores occur around each zooecium but do not isolate zooecia. Zooecial walls thin; they display laminate wall structure in which the laminae are steeply inclined along the inner part of the zoo-

EXPLANATION OF PLATE 2

Figs. 1–5. *Homotrypa oweni* sp. nov. 1, Deep tangential section across more proximal and medial parts of colony, paratype LL 2807C, ×20. 2, Tangential section showing thin-walled zooecial tubes, small acanthopores, and cystiphragms across zooecial openings, paratype LL 2807B, ×50. 3, 4, Parts of longitudinal sections showing basal lamina, reclined proximal portions of zooecial tubes, and numerous cystiphragms and sparse diaphragms in more distal portions of zooecial tubes, holotype LL 2807A, paratype LL 2807D, ×50. 5, Oblique longitudinal section through encrusting tapering colony, holotype LL 2807A, ×20.



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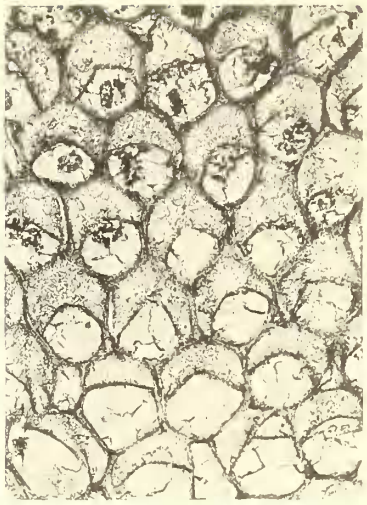

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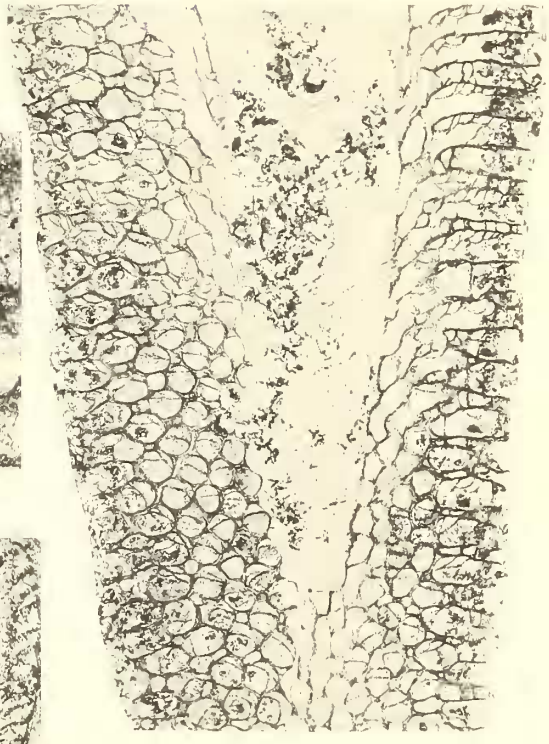

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ecial tube and curve for a short distance in the outer part of zooecial wall where they abut against laminae of adjacent zooecial walls.

Remarks. In this species the form of the colony is most distinctive; both the cone shape and the encrusting habit. This species is not closely comparable to any previously described species of *Homotrypa* and in internal features is characterized by regular, overlapping cystiphragms on the distal zooecial walls and sparse diaphragms in the zooecial tubes, indistinct acanthopores, and an abundance of mesopores which are evenly spaced between zooecial openings.

This species is also present in collection RR 2669 in the Geological Survey Museum, London, from Wylde's Quarry, 30 chains south-west of Harnage Grange, Shropshire (Pocock *et al.* 1938, fig. 28). The species is named after Dr. D. Owen, Director, Manchester University Museum.

Family AMPLEXOPORIDAE Miller
Genus AMPLEXOPORA Ulrich

Amplexopora? evenensis sp. nov.

Plate 3, figs. 1–3; Table 2

Material. Holotype, LL 2823A. *Paratypes*, LL 2823B figured, LL 2823C–L unfigured.

Description. Robust cylindrical to subglobular branching colonies; stems 4 to 5 mm. in diameter; some small overgrowths. Polygonal zooecial openings are enclosed by very slender amalgamate zooecial walls (Pl. 3, fig. 1). Polygonal mesopores are interspersed between zooecial tubes and small, though at times indistinct, acanthopores commonly penetrate the junctions of the zooecial walls and, in some instances, a second set of acanthopores are located near the junctions of the zooecial walls and may lie near the inner part of the zooecial walls. Long zooecial tubes with broadly crenulate zooecial walls slope steeply from the axial region and pass into the very narrow peripheral region where zooecial walls are closely crenulated (Pl. 3, figs. 2, 3). Diaphragms are absent in the axial region, closely spaced in the subperipheral region, and absent in the peripheral region. Diaphragms in the subperipheral region may be flat, curved, or overlapping cystoidal. Acanthopores, commonly difficult to observe in longitudinal sections, appear as narrow rods with walls of steeply inclined laminae; some extend from the subperipheral region and others project above the zoarial surface. Deep tangential sections display only a few acanthopores and expanding mesopores. Zooecial walls are slightly thickened in the peripheral region, where they display inclined laminae in the inner part of the walls. These laminae are curved in the outer part of the zooecial walls and are amalgamate in a dark irregular band with laminae of the adjacent wall. Mesopores arise in the subperipheral region, extend to the periphery, and have sparse diaphragms in the subperipheral region. At three to four corresponding levels in the colonies, there is bifurcation of the zooecial tubes with a marked increase in the diameter of the zoarium; sometimes associated with this bifurcation of the tubes is a curved band of one or two diaphragms which extends across the colony.

Remarks. This species is characterized by slender, crenulate zooecial walls, small but

distinct acanthopores, some of which extend into the subperipheral region, and a small number of diaphragms in the subperipheral region of the zooecial tubes and mesopores. *Amplexopora? evenensis* has little similarity with previously described species, which generally display thicker walls, larger zooecial tubes, and a greater abundance of diaphragms. *Amplexopora winchelli* (Ulrich) (1893, 'Middle third of Trenton shales, at St. Paul', pl. 27, figs. 1, 4, 6) has polygonal zooecial openings, small acanthopores, diaphragms in the subperipheral region, and a lack of diaphragms in the peripheral region. However, Ulrich's other illustrations (pl. 27, figs. 2, 3, 5, 7, 8) show thicker-walled zooecia, more numerous and larger acanthopores, and a great abundance of

TABLE 2 Measurements of *Amplexopora? evenensis* sp. nov. (in millimetres)

Catalogue no.	*LL 2823B*	*LL 2823A*
Diameter of colony	Not determined	4
No. of zooecia per 2 mm.	9 to 11	9 to 11
Diameter of zooecial opening, max.	0·27×0·28	0·29
min.	0·16×0·20	0·17
Combined thickness of adjacent zooecial walls in peripheral region	0·02	0·01 to 0·03
Diameter of mesopore, max.	0·16×0·05	Not determined
min.	0·05×0·02	0·04
Diameter of acanthopore	0·01 to 0·03	0·01 to 0·02
No. of acanthopores per zooecium	2 to 5	Not determined
No. of diaphragms per 1 mm. in zooecial tube in subperipheral region	Not determined	3 to 4

diaphragms. *A. pustulosa* Ulrich (1890, 'Cincinnati group. Hanover, Clarksville, and other localities in Ohio') likewise, while displaying some similarities in polygonal zooecial openings and small acanthopores, is considerably more robust in its zooecial and zoarial structures. *A. ampla* Ulrich and Bassler (1904, 'Fairmount beds, Cincinnati, Ohio') has larger zooecial tubes and diaphragms in the axial region. Slender zooecial walls, narrow peripheral region, and small acanthopores suggest similarities with *A.? evenensis*.

This new species takes its name from Evenwood Quarry.

EXPLANATION OF PLATE 3

Figs. 1–3. *Amplexopora? evenensis* sp. nov. 1, Deep tangential section showing polygonal zooecial openings and mesopores, and small acanthopores at junctions of zooecial walls, paratype LL 2823B, ×50. 2, Peripheral region of part of longitudinal section showing thickened crenulate zooecial walls, holotype LL 2823A, ×50. 3, Part of longitudinal section showing sparse diaphragms in axial region and concentration of diaphragms in subperipheral region, holotype LL 2823A, ×20.

Figs. 4, 5, 7, 8. *Amplexopora?* sp. A. 4, Longitudinal section showing crenulate zooecial walls and sparse diaphragms in zooecial tubes and mesopores and occasional cystiphragm in zooecial tube, LL 2824B, ×50. 5, Longitudinal section showing general aspect of zooecia and mesopores, LL 2824B, ×20. 7, Deep tangential section showing round to subpolygonal zooecial openings, polygonal mesopores, and an occasional acanthopore at junction of zooecial wall, LL 2824A, ×50. 8. Longitudinal section showing part of overgrowth with very distinct cystiphragms, LL 2824B, ×50.

Fig. 6. *Homotrypa oweni* sp. nov. Part of longitudinal section showing laminate structure of zooecial walls and cystiphragms in zooecial tubes, paratype LL 2807D, ×100.